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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO
09 376,063	08 17 1999	SEIJI ANDOH	OKI-226	5971

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EXAMINER

DATSKOVSKIY, MICHAEL V

ART UNIT	PAPER NUMBER
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2835

DATE MAILED: 05 24 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/376,063

Applicant(s)

ANDOH, SEIJI

Examiner

Michael Datskovsky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☐ Claim(s) 20, 22 and 24-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 20, 22 and 24-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed 05/17/2002 have been fully considered but in the interpretation of the reference by Katchmar they are not persuasive. Examiner does not agree with applicant's assertion that "Katchmar fails to teach or suggest a distinct intermediate area between the central area and the peripheral area". Included is a page comprising fig.5 of the reference by Katchmar wherein in red color is shown examiner interpretation of this figure. Contrary to applicant's assertion, there is no "distinct intermediate area" claimed in the instant application, and what is shown as an intermediate area in fig.5 from examiner's point of view is big enough to be distinguished. Semiconductor packages having three separate bottom areas: central with solder balls for cooling, peripheral with solder balls for signal lines and an intermediate area in-between them without solder balls are well known in the art. There are several prior art references (Bond et al, Rostoker et al, Haley, Barrow and Shim et al) already cited in the previous office actions, which teach such a structure.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 26, 28 and claims 27, 29-31 as dependent on them are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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4. The terms: "distances are set such that upon application of a heat treatment to the device, the bumps of the first bump unit melt so as to become connected and fuse to each other as a unitary body" in claim 26 and "bumps of the first bump unit are sufficiently closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit fuse into a unitary body" in claim 28 are relative terms which renders the claims indefinite. The terms are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 20, 22 and 24-31 (claims 26 - 31 as best understood by examiner) are rejected under 35 U.S.C. 103(a) as being unpatentable over Katchmar in view of Bond et al.

Katchmar teaches a semiconductor device, figs 1-5, comprising: a substrate 12 having a main surface 14 and a back surface 16, wherein said back surface 16 has a central area 32, an intermediate area surrounding said central area 32 and a peripheral area surrounding said intermediate area; a semiconductor chip 18 formed on said main surface; a first bump unit formed of solder bumps 40. Fig. 5 disposed at a first distance

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apart from each other, and located in said central area of said back surface, wherein said first bump unit radiates heat from said semiconductor device; a second bump unit formed of solder bumps 24 disposed at a second distance apart from each other and located in said peripheral area of said back surface, wherein said second bump unit transmits signals (col.6, lines 50-53), wherein the second bump unit is greater in quantity of solder balls than the first bump unit, and said solder balls are spherical in shape. Katchmar teaches furthermore a second distance between signals bumps being greater than a first distance between heat transferring bumps (col.7, lines 39-47). Also in the embodiment shown in figs.1-4 Katchmar teaches that said central area could be thermally connected to said circuit board by a solid melted solder mass 26.

Katchmar does not teach that second distance is less than a width of the intermediate area, and said melted solder mass (unitary body) can be made by locating bumps of the first bump unit sufficiently closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit fuse into a unitary body. Bond et al teach a semiconductor device 8, figs 1-6, comprising: a substrate 14 having a main surface and a back surface, wherein said back surface has a central area, an intermediate area surrounding said central area and a peripheral area surrounding said intermediate area; a semiconductor chip 10 formed on said main surface; a first bump unit formed of solder bumps 18 disposed at a first distance apart from each other, and located in said central area of said back surface, wherein said first bump unit radiates heat from said semiconductor device; a second bump unit formed of solder bumps 18 disposed at a second distance apart from each other and located in said peripheral area

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of said back surface, wherein said second bump unit transmits signals, the second distance is greater than the first distance, the second distance is less than a width of the intermediate area (see fig.1 in the enclosed page from reference by Bond et al with red color indicating discussed sizes), and the second bump unit is greater in quantity of solder balls than the first bump unit, said solder balls are spherical in shape. Bond et al also show in fig.2 bumps 18 of the first (central) bump unit located so closed to each other that upon the application of the heat treatment to the device, they will obviously fuse into a unitary body. It would have been obvious to one skilled in the art at the time invention was made to employ the second distance being less than a width of the intermediate area, and to locate bumps of the first bump unit so closed to each other that upon the application of the heat treatment to the device, the bumps of the first bump unit will fuse into a unitary body as it is shown by Bond et al in the device by Katchmar in order to avoid shortening between thermal and signal solder balls while applying a heat to melt said thermal solder balls in a unitary body, and to enhance heat dissipation by a central group of solder balls. Regarding to the claim 31: Katchmar and Bond et al do disclose the claimed invention except for that "the first distance is about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance is about 1.6 to 1.7 times the diameter of the bumps of the second bump unit. It would have been an obvious matter of design choice to make the first distance about 1 to 1.4 times the diameter of the bumps of the first bump unit, and the second distance about 1.6 to 1.7 times the diameter of the bumps of the second bump, since such a modification would have involved a mere change in the size of a component. A change

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in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose*, 105 USPQ 237 (CCPA 1955). Applicant has not shown that these particular ranges of sizes are critical by showing that the claimed range achieves unexpected results relative to the prior art range. (*In re Woodruff*, 919 F. 2d 1575, 16 USPQ2d 1934, Fed. Cir. 1990). To establish unexpected results over a claimed range, applicant should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. (*In re Hill*, 128 USPQ 197 CCPA 1960).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Datskovsky whose telephone number is (703) 306-4535. The examiner can normally be reached on Mn - Fry 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren E. Schuberg can be reached on (703) 308-4815. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Patent Examiner

Michael Datskovsky

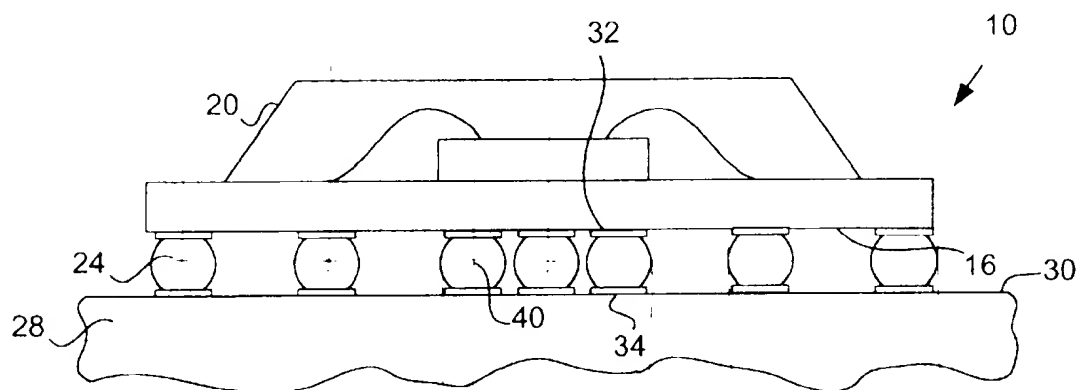


May 24, 2002

*501/100*

*65a*

*central area and peripheral area*



*central area and peripheral area*

Fig. 5

*central area and peripheral area*



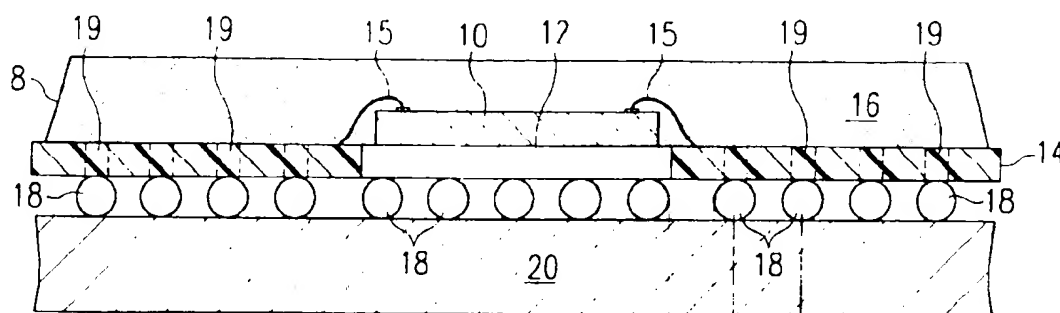


FIG. 1

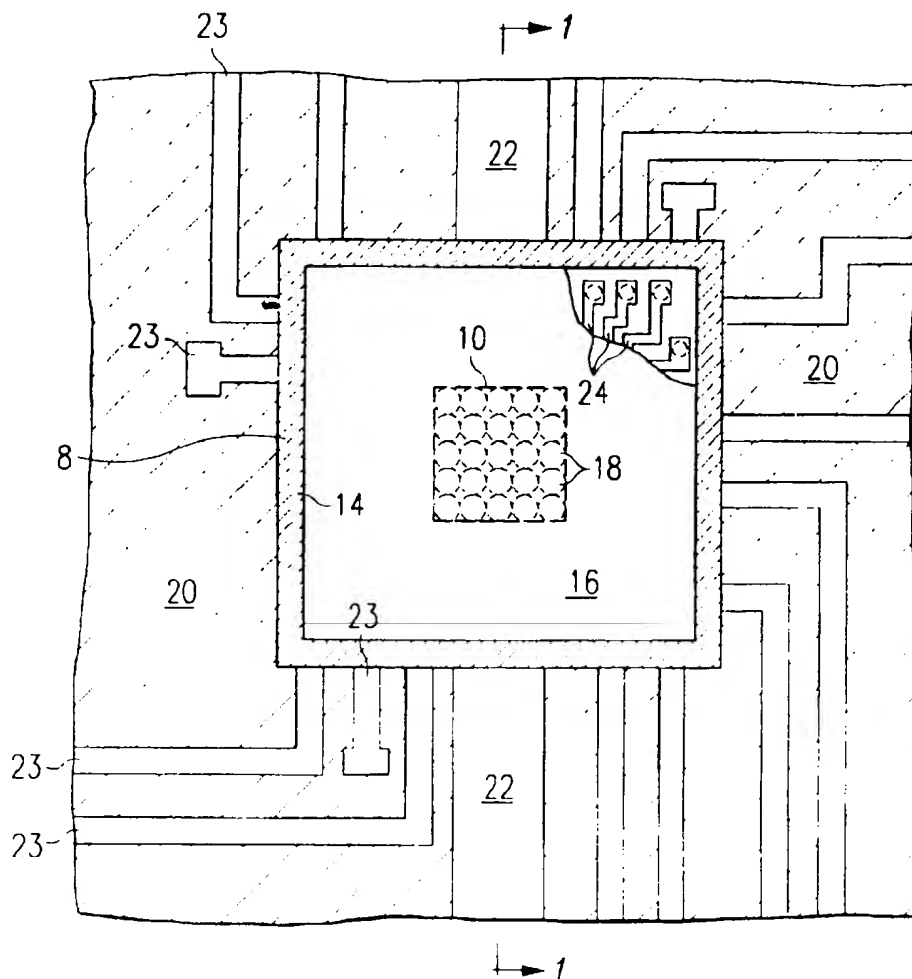


FIG. 2